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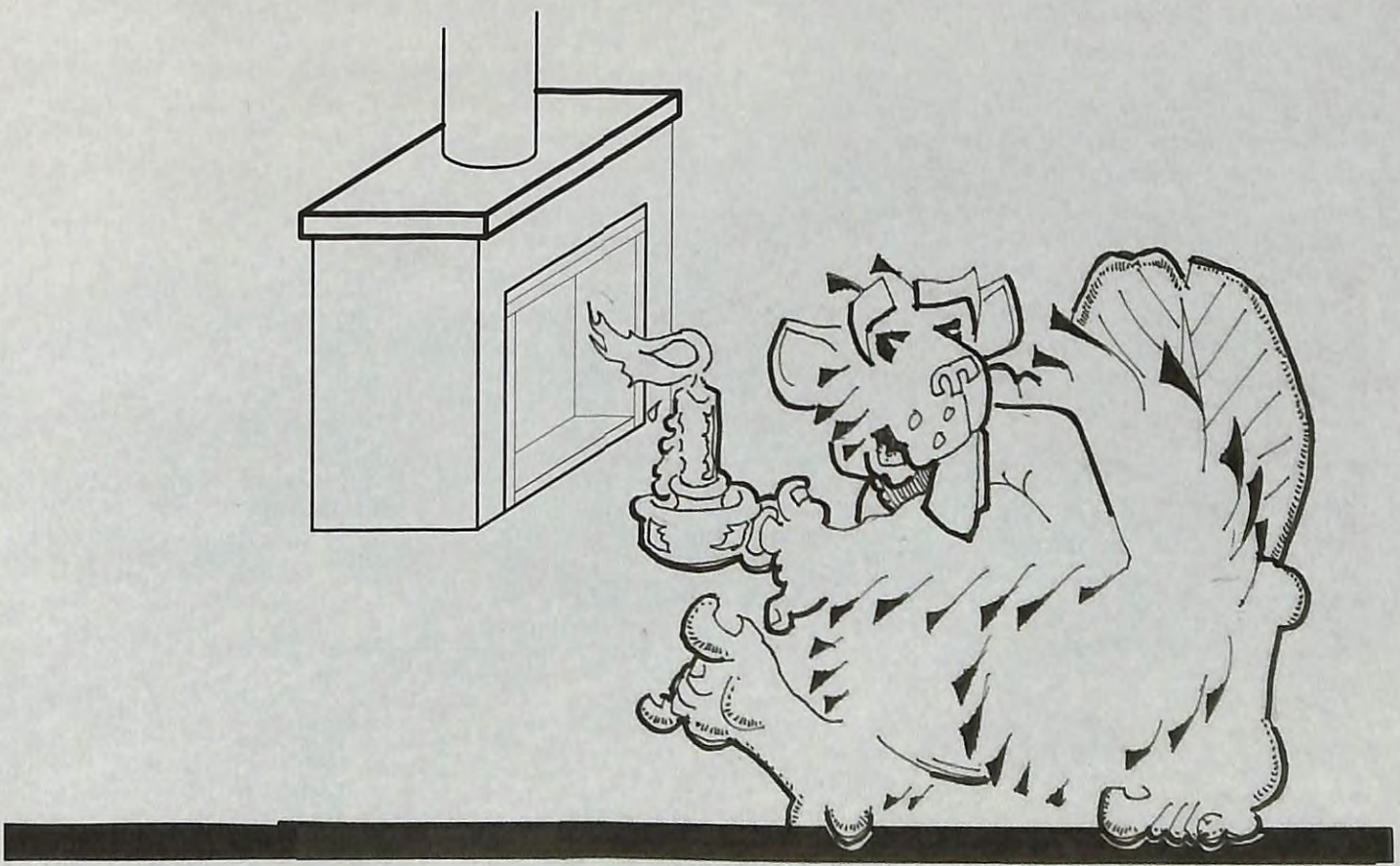
Gas Fireplace Efficiency



From the Editor . . .

Today's interest in sustainable, green building appears to be gaining traction. This is leading to a renewed interest and growth of labelling programs. Unfortunately, interest in green building does not always mean significant improvements.

Consumers may or may not know what the labels mean or what's behind the label, but the credibility, or the perceived credibility of the third party issuing organization, is what offers the added cachet of respectability.

There is no doubt that when a third party reviews or issues a certificate, with its implied hands-off inspections, it provides a more robust system. But no matter what kind of label is issued or who issues it, it is the criteria underlying the program that must be considered.

Standards must be carefully developed, and must have some meaning. Regrettably, most labelling initiatives have strengths in some fields, but are not truly as comprehensive as they should be, recognizing that a building is a system, and should be treated as such. Most green programs focus on materials, especially the origin of the materials and their embodied energy content. Less attention is given to the performance of the whole building.

Labelling systems are also important because they are used as a yardstick for how to build more responsibly, so that even when a builder or owner chooses not to certify their project, they may follow the criteria. These 'clones' can account for many times more activity than actual certifications, and help move the industry. That has been the case over the years with R-2000, which, although it has had small numbers of actual certified numbers, has been used as a yardstick by many to improve their housing specifications.

The value of labelling programs also depends on how the program is administered. Merely setting out a standard, and issuing an application or enrolment form will not have the impact. That is why training and technical support is also very important.

Young builders and designers bring enthusiasm, energy and a willingness to implement new ideas, but they often lack experience and expertise, which comes through education, trial and error, and experience. But without the training and technical support, they will not achieve the lofty goals they may be aiming for, and get discouraged in the process, not to mention repeat mistakes others may have made.

It is really important to recognize the need for training and technical support. This was brought home to me recently, as I visited a site by a new builder. As a launch for their new business, they are starting out with a showcase home, aiming to meet the certification requirements of several labelling programs. Although finishing meets a very high standard, and very interesting products were used in the construction, some dubious decisions were made about materials chosen and the design itself. Some of these issues could have been addressed in time to resolve or avoid problems if there had been a requirement for training.

I think it was Kermit the Frog on Sesame Street who said that being green was not always easy. We have to move to deep green, and quickly, but at the same time we need to make sure that actions are meaningful. We need to ensure that whatever programs are used to show green or sustainable construction, they do more than merely spell out what should be done, but also require training and provide technical support.

Richard Kadulski,
Editor

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Gas Fireplace Efficiency

Gas fireplaces are a central feature in many homes built today. In fact, it not uncommon to see three or more fireplaces in one home as they find their way into more than just living room or family room locations. While a primary reason for their being is aesthetics, many gas fireplaces are also designed with heating in mind. The various product designs generally reflect their intended function; whether they are mainly decorative and intended for occasional use or more efficient and also intended to provide supplemental home or zone heating. Some apartments in coastal BC are designed to be heated by gas fireplaces.

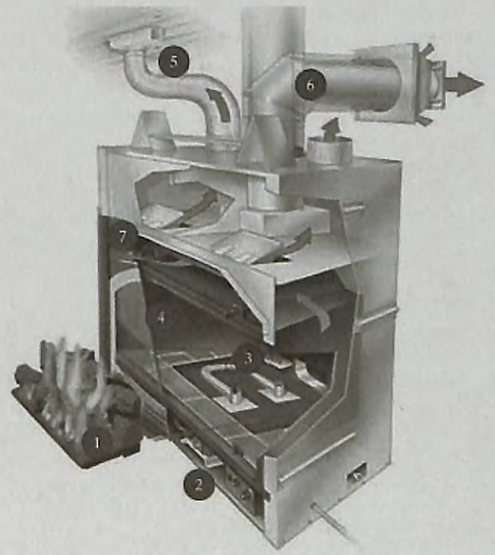
Because of the widespread adoption of gas fireplaces, there has been a need for a rating system to measure their performance. The overriding objective has been to develop reliable means to determine fireplace efficiency and to provide credible information to consumers concerning energy efficiency.

The hearth products association (HPBAC) and the gas fireplace industry have been engaged with other stakeholders in a long process that has resulted in the development of the CSA P.4.1 Test Standard for measuring fireplace efficiency. Testing to this standard produces a fireplace efficiency (FE) rating which provides a good measurement of fireplace energy efficiency.

The EnerGuide FE rating is the only recognized measurement of vented gas fireplace energy efficiency in Canada and is expressed as a percentage. All gas fireplaces sold in Canada must now be tested in accordance to the P4.1 standard and must display the EnerGuide rating. Tests have shown that some units operate in the 30 percent range, while the better units range from 50 percent to 70 percent

The FE rating must be included with product information, and can be found in product literature. In addition, the HPBAC has developed the EnerChoice label (*www.enerchoice.org)* used in BC to recognize the most efficient models in each of the three main gas fireplace categories – Inserts, Freestanding Stoves and Zero Clearance.

The best performers in the heating category meet the criteria for the EnerChoice label which can only be applied to free-standing stoves with an energy efficiency of 66% or higher, fireplaces that are 62.4% or higher and inserts that are 61% and higher. Gas logs do not have an EnerGuide number, so are assumed to have an efficiency of 0%. Units that meet EnerChoice criteria are posted on the web.



Higher-efficiency equipment saves money and energy in the long run. The actual savings will depend on local climate, the cost of fuel, the efficiency of the appliance and the efficiency of the dwelling itself.

Gas Appliance Efficiency

In our effort to reduce environmental impact, we are developing and using much more efficient energy technologies. Energy regulations are now in place in many regions requiring the use of only high efficiency, condensing gas furnaces in new construction. The underlying premise is to avoid the use of standing pilot lights, which consume energy and, especially in energy efficient homes, do not provide any net benefit to the home for long periods of the year. In fact, during the non-heating season, they can add to the cooling load in regions with warm summers.

The City of Vancouver has introduced new building bylaws that only allow the use of sealed combustion, direct-vent fireplaces with electronic ignition in new single-family construction. Retrofit and renovations are not covered by the new bylaw.

Pilot Light Definitions

Standing – a pilot ignition source which, once placed in operation, is intended to remain ignited continuously until manually interrupted.
Intermittent – a pilot ignition source which is automatically ignited when an appliance is called on to operate and which is automatically extinguished when each main burner operating cycle is completed.
On Demand – controls or devices which provide the user with ready means to initiate the automatic ignition of, and the automatic extinguishment of, a pilot ignition source. The device is external to the gas safety combination control and does not require any direct interaction with the gas safety combination control by the user.
The means to initiate the pilot ignition and extinguishment are usually mounted external to the appliance controls compartment or are contained in a remote control device

From CSA - P.4.1 Test Method for Determining Annual Gas Fireplace Efficiency P.4.1 Standard© Canadian Standards Association
Draft: July 25, 2008

Electronic ignition for gas appliances has a number of meanings. The hearth products folks indicate that simply stating that a gas fireplace must have electronic ignition is not sufficiently clear for gas fireplaces. At first glance defining ignition systems may appear to be a discussion for researchers. However, there are some limitations and criteria that the technology imposes.

The common reference to electronic ignition is applied to furnaces and boilers. These have small, clean combustion chambers with precise burners set to burn blue,– which provides the most efficient flame. They are typically power vented with pre-purge and post-purge operating cycles, are located in furnace rooms, and are controlled automatically by thermostatic means. Modern furnaces achieve safety and reliability employing Direct Spark Ignition systems.

On the other hand, gas fireplaces, because they are decorative elements, located in living spaces, have large combustion chambers (up to 5 cubic feet) fronted with glass designed to resemble a wood fireplace. The burners may take various forms to create realistic flames and loose media such as mineral wool, ceramic and glass may be used to generate the flames. Because burners are adjusted for brightness and light, carbon may deposit on surfaces. Because owners may open the glass window to do their own cleaning and maintenance, ignition systems must be designed with this in mind.

Gas fireplace venting is mainly balanced flue, direct-vent (vertically or horizontally terminated). These are natural draft flue systems meaning that when outside temperatures drop, the heat from the fireplace at start up must overcome the cold column of air in the vent. Longer direct vent systems can experience start-up lag when cold, resulting in flame lift and burner outage. This can even be more of a technical issue on more efficient designs that also may employ heat exchangers or flue restrictors to raise thermal efficiencies and also to control excess air that can affect the start-up of the vent action.

They are controlled by users and sometimes also by a thermostat.

New generation electronic ignition controls allow the operator to maintain a pilot flame during colder weather to avoid this problem.

All gas fireplaces (without exception) employ a pilot burner to light the main burners for reasons of safety and reliability. The CSA - P.4.1 Test Method for Determining Annual Gas Fireplace Efficiency, has three recognized forms of burner ignition that are reflected in the FE (Fireplace Efficiency) EnerGuide number;

- Standing Pilot
- Intermittent
- Pilot-on-Demand

Intermittent and Pilot-on-Demand systems use electronic means to light the pilot light. In the case of intermittent systems, most manufacturers provide a provision to switch into standing pilot mode. When conditions warrant, users are instructed to switch to a standing pilot mode to maintain standby heat in the vent system.

Depending on the thermal efficiency of the fireplace, some portion of the pilot heat is returned to the space. With Pilot-on-Demand systems (which are found on Valor units), the operator can light or extinguish the pilot from a remote handset or wall switch every time the fireplace is operated.

The ability to run on batteries (as in the case of Valor's Pilot-on-Demand system) or use a battery back-up is a real advantage in power outage situations.

Both Intermittent systems with a selectable standing pilot switching option and Pilot-on-Demand electronic ignition systems allow the user the opportunity to minimize wasted pilot gas consumption. That is why the HPBAC folks are suggesting that these systems should be recognized and acceptable to all authorities that may wish to regulate gas fireplaces. ☼

Fireplace Efficiency

Fireplace energy efficiency is the comparison of two pieces of information – the input value of the gas versus the usable heat output. A fireplace with a gas input of 30,000 BTUs and a heat output of 20,000 BTUs would be 66.6% efficient. A unit with a gas input of 40,000 BTUs and a heat output of 20,000 BTUs would be 50% efficient.

Product selection should be determined by the heat output (not input) of the fireplace. It is also important to select a product with the ability to turn down to a low firing rate, especially higher efficiency models, as comfort is better maintained with a constant low fire rather than cycling on and off to avoid overheating.

By comparison, the average residential gas hot water heater is only about 50% efficient, while new condensing gas furnaces are typically 90+%.

Efficiency is important but it's only a part of the story – you also need to factor in the aesthetics of the fire which is why most people want a fireplace in the first place.

HPBAC has long maintained that pilot flames in efficient designed fireplaces located in living zones are not a significant waste during the heating season.. For example, a 1,000 BTU/hr pilot on a higher EnerChoice rated fireplace can provide approx 600-700 BTU/hr of background heat into the room that the primary heating system will not have to operate to generate. This relatively small amount of heat should not cause overheating in typical single-family residences during the heating season because they are typically located in the main living area.

How Airtight Can You Build?

When it was first published, one of the key criteria of the R-2000 Standard was a very aggressive airtightness standard. To meet R-2000, houses must not exceed an air leakage in excess of 1.5 air changes per hour at 50 Pascals or an equivalent leakage area of 1 $in^2/100\ ft^2$. Generally, once a builder sets out to build to the standard, they find that it is achievable although it does require some ongoing site supervision.

A friendly rivalry is emerging, as builders aim to build ever more airtight homes, as airtightness is a significant factor in achieving high levels of energy efficiency. The NetZero and Equilibrium home builders aim for much more airtight construction.

The Riverdale NetZero Project, one of the CMHC-supported Equilibrium homes, had its final air leakage test in June. The results are very close to their target of 0.5 air changes per hour (AC/h) at 50 pascals (Pa). This is equivalent to a leakage area that is less than 20 square inches across the entire building envelope.

Because the building is a side-by-side duplex, they noted that a small amount of air leakage was between the units through the party wall itself to the outside. In a future duplex they would simplify this by sealing the party wall on both sides as if it were an outside wall to get the added benefit of additional cross-unit sound abatement.

The builders thought it would not be realistic to expect to get much more airtight, however, they are pleased to report that the preliminary air test result on their next low energy project, the Mill Creek NetZero house, was 0.36 AC/h @50 Pa. They are hoping that once the house is completed, and all interior and exterior finishes are in place, this will come down a bit more.

These results were achieved at a rough cost of $4 per square foot of wall area ($43/m^2$). This $4 includes the cost of upgrading from 2x6 walls with an effective R-value of between 15 and 17 to double-stud 16" cellulose-filled walls with a HOT-2000-calculated effective R-value of 56. The required extra care and attention is included in that number, but the extra square footage lost in the wall is not.

In warmer parts of the country they suggest that a 12" wall thickness would likely be enough. The lost space would be reduced and the cost would come down by about $0.75 per square foot ($8/m^2$).

The builder, Peter Amerongen of Habitat Studio & Workshop Ltd., gives credit for these results to the framer, the insulator and the other Habitat Studio personnel who did the preliminary air sealing work. He thinks that 0.7 AC/h shouldn't be that hard to achieve with a reasonable level of care and attention even by workers using this system for the first time. CMHC is developing a fact sheet on their double-wall system.

Information:
Riverdale Project – *www.riverdalenetzero.ca*
Mill Creek NetZero house – *www.greenedmonton.ca*

Green Labelling
What's in a Label?

Today there is a lot of interest in things 'green'. Consumers have started to take a serious interest in environmentally responsible actions, including choices for new homes or home renovations. Third-party labels offer a means of verifying claims – especially important for complex systems such as a building.

The R-2000 brand has been in existence since 1982 when it was created as a response to energy efficiency concerns. It provides a verified third-party certification that a home meets stringent energy efficiency performance – perhaps the most important element for an environmentally responsible building. Although the R-2000 standard may have had limited numbers of certifications over the years, the program has provided industry education and upgrading, spurred innovation, and been a leading driver for energy efficiency improvements in housing. And it is recognized internationally as a benchmark for high performance housing.

Over the years the technical requirements for the R-2000 standard have been upgraded and certification criteria for environmental responsibility, indoor environment and water conservation have been introduced. However, the underlying principle remains – an emphasis on energy conservation – which is the most important feature that defines a building with low environmental impact.

In recent years, new labels have appeared. Some are regional, adding criteria to deal with local environmental, legislative and industry concerns, others national or even international in scope. Each makes its own claims to provide a better or more meaningful label although when analysed, they generally cover many of the same issues, with some variations. The variations generally deal with specific benchmarks that define criteria to be met and how rigorous they are, and administrative issues.

The launch of the LEED® Canada for Homes Rating System (LEED-H) this year has underlined the renewed interest in home labelling. Homeowners want not only some form of assurance that they are getting the extra that is verified by a rating system, but are also looking for the cachet or bragging rights associated with a label.

The LEED (Leadership in Energy and Environmental Design) rating system was originally developed by the US Green Building Council (USGBC) for the US market, as a means to spur market transformation to more sustainable building practices, and it has done exceedingly well at that. The original, and still the principal focus of LEED, is the commercial and institutional building sector.

The proliferation of green building home programs, some with questionable standards, generated pressure for the USGBC to develop the LEED for Houses initiative which aims to set a stringent benchmark for the US housing market. It is an initiative designed to promote the transformation of the mainstream homebuilding industry toward more sustainable practices. It reflects many environmental and energy issues in the US, especially in the southern US.

Following on the market transformation success of the Canadian version of the LEED program in the commercial/institutional sector, the Canada Green Building Council (CaGBC) adapted the US version to Canadian circumstances, and launched LEED® Canada for Homes Rating System which aims to offer a premium program that hopes to capture the top 25% of new homes.

While there are already a number of local or regional green homebuilding programs, LEED-H is attempting to provide national consistency in defining the features of a green home and to enable builders anywhere in the country to obtain a green rating on their homes.

Regrettably, some of the shortcomings of the US rating system have carried over to the Canadian version, largely because of the short time frame taken to review and convert the US document.

We are now seeing a friendly rivalry between the Canadian Home Builders Association, which has been intimately involved with the R-2000 program since its inception in 1982, and CaGBC and the LEED ratings.

CHBA has completed an analysis of the LEED Canada for Homes standard, which includes a comparison with Canadian construction standards. Although industry always has concerns with imposed regulations, they are grudgingly accepted as a necessity. Building codes and associated regulations do set a uniform minimum standard that requires mandatory compliance. Canadian energy standards have now progressed to the point that in most of Canada energy code requirements exceed or at least equal the minimum prerequisite requirements for certification by LEED-H.

LEED-H requires a minimum number of points for compliance, with a minimum number of points required within some categories. The minimum LEED-H energy efficiency criteria requirements are at, or below, current and proposed provincial Code requirements in many regions. There are no minimum number of points required for energy efficiency, as long as the minimum ERS-76 is met.

CaGBC rationalises this by suggesting that since LEED-H is a national standard, it strikes a balance between regions with strong prescriptive or performance energy requirements and regions that have less strong energy requirements or none at all. Builders, architects and developers in some regions in the country may find ERS-76 quite challenging, others may be able to exceed it and gain more credit in LEED Canada for Homes. The LEED-H Rating System is designed to help reward increased performance all the way up to a net zero home.

CaGBC also notes that many of the first prototype homes registered are aiming much higher than the minimum and achieving ERS ratings in the high 80's, a few in the 90's and one (an Equilibrium home) achieving ERS 100. However, an initiative that aims to provide a benchmark for transforming mainstream housing toward more sustainable practices should be doing more than accepting code minimums. It should be setting a benchmark that leads and prompts the industry to do better, rather than accepting the current status quo. One reason R-2000 certifications are limited in number is because there are no compromises on the minimum standard that must be met.

Unfortunately, downplaying energy efficiency reinforces the image that many, especially in the design community, have – that energy efficiency is difficult to achieve and in the end is not really that big an issue. Consequently, a lot of effort is devoted to the provenance of materials and their embodied energy, even though overall the embodied energy is a much smaller part of the sustainability equation.☼

Building codes and new home labelling programs have different roles and intentions so that making a comparison of the two can be problematic. However, contrasting the requirements of codes with the measures included in labelling programs provides insight into where each fits within the home building continuum.

Building Code requirements in BC and Vancouver (and in Nova Scotia by the end of 2009) currently exceed the LEED-H performance path prerequisite for energy efficiency.

Building Code requirements in British Columbia, Vancouver, most places in Ontario and Manitoba (and in Nova Scotia by the end of 2009) exceed the LEED-H prescriptive requirement for insulation.

In British Columbia, LEED-H air infiltration prescriptive requirements represent Code minimum requirements. This will also be the case in Nova Scotia by the end of 2009, and Ontario by the end of 2011, if EnerGuide-derived requirements are adopted within a prescriptive framework.

In British Columbia, Vancouver and Ontario (and in Nova Scotia by the end of 2009) the LEED-H window prescriptive requirement for both good and enhanced windows represents minimum Code requirements.

In coastal British Columbia and southern Ontario (and all of Nova Scotia by the end of 2009), Code requirements are at the level of LEED-H space heating and cooling prescriptive requirements.

LEED-H certification levels	
Certified	45-59 points
Silver	60-74 points
Gold	75-89 points
Platinum	90-136 points

To compensate for the effect of home size on resource consumption, point thresholds are adjusted based on home size. Larger homes have a higher threshold, while smaller homes have a lower threshold.

The LEED® Canada for Homes Rating System measures the overall performance of a home in eight categories:		
Innovation & Design Process	11 points available, mandatory measures give 3, no minimum number required	Credit for special design methods, unique regional credits, measures not currently addressed in the Rating System, and exemplary performance levels.
Location & Linkages	10 points available, mandatory measures give 0, no minimum number required	The placement of homes in socially and environmentally responsible ways in relation to the larger community.
Sustainable Sites	22 points available, mandatory measures give 2, minimum number required 5	The use of the entire property so as to minimize the project's impact on the site.
Water Efficiency	15 points available, mandatory measures give 1, minimum number required 3	Water-efficient practices, both indoor and outdoor.
Energy & Atmosphere	38 points available, mandatory measures give 2, *no minimum number required*	Energy efficiency, particularly in the building envelope and heating and cooling design.
Materials & Resources	16 points available, mandatory measures give 3, minimum number required 2	Efficient utilization of materials, selection of environmentally preferable materials, and minimization of waste during construction.
Indoor Environmental Quality	21 points available, mandatory measures give 7, minimum number required 6	Improvement of indoor air quality by reducing the creation of and exposure to pollutants.
Awareness & Education	3 points available, mandatory measures give 1, no minimum number required	The education of the homeowner, tenant, and/or building manager about the operation and maintenance of the green features of a LEED® home.

Single Room Heat Recovery Ventilators

Conventional heat recovery and energy recovery ventilators are designed as whole house systems. Typically, a centrally located HRV unit has exhaust air ducted to it from the bathrooms and kitchen, and as the exhaust air passes through the heat recovery core it heats the incoming air which is then circulated through the house through the forced warm air heating ducts. In homes without forced air heating, the ventilation system has to be sized for ventilation airflows and fully ducted.

It can be a challenge to introduce ventilation into apartments and retrofit applications simply because there is no ducting in place, and retrofitting ducts can be difficult and expensive.

An interesting room-sized energy recovery unit has been developed in Germany and has German building code approvals.

inVENTer® is an energy recovery ventilation unit that is designed to be mounted in the exterior wall to provide single room ventilation. Airflow is controlled by a microprocessor. Exhaust air passes through a ceramic core, which absorbs the heat and moisture, and after 60 seconds or so, the fan is reversed and fresh incoming air is warmed up and humidified by the core, after which the cycle is repeated.

The claimed energy recovery efficiency is up to 92% with an airflow capacity of 18 cfm, and a power consumption of 2-3 watts. The constant modulation of airflows and moisture transfer avoids frost and condensation issues, and the core and filter are easy to clean.

The units could meet a niche market for retrofitting energy efficient ventilation in difficult to access rooms, although they are not inexpensive.

Information: *www.inventer.eu*
Canadian representative:
www.enerconcept.com

NRCan's New Housing Vision

Provincial building codes are upgrading their energy standards, with a number of provinces now requiring an EnerGuide rating for new houses at or near 80. As a result, NRCan is embarking on a process to set, with stakeholders, the direction for the next generation of energy efficiency programs in Canada.

The vision for NRCan's New Housing programs is to have a next generation EnerGuide Rating System (ERS) that can accommodate advances in new housing technologies for new and existing homes, and to recognize better building practices, including net zero energy homes.

Two levels of energy efficient better building standards are envisaged: a prescriptive-based system (e.g. the next generation of ENERGY STAR) at a level that is about 25% above the code level for broad adoption; and a second, best in class label, at about ERS 86, denoting best practices and setting the stage for the transition to broad-based inclusion of next generation and renewable energy technologies.

NRCan has begun three formalized consultative processes: the development of the next generation of the EnerGuide Rating System (ERS), the renewal of the R-2000 Standard and the development of a common specification for ENERGY STAR for New Homes (ESNH) in Ontario.

The review will look at how the current premium labels (R-2000 and ENERGY STAR) will fit into the vision and ensure NRCan is in a position to provide systems, standards and tools to support and encourage a higher level of energy efficiency in houses across Canada.

The goal for the EnerGuide Rating System is to develop the most effective next generation energy rating system for new and existing houses that is supported by the best tools and is acceptable to and recognized by all stakeholders. To achieve this, NRCan has launched a consultative process to renew the ERS and associated tools. The process will be based on a Standards Council of Canada approach, taking into consideration National Building Code procedures, and will include broad and structured consultations and consensus-based decision making.

This process will take into consideration the needs of provinces and territories that plan to mandate an ERS target in their building codes as well as voluntary green building programs that reference the ERS. An ERS Advisory Committee will be assembled over the summer with consultations commencing this fall. The target is to have the renewed system in place by April 2011.

The next generation of ERS, the R-2000 Renewal, and the ENERGY STAR for New Homes Common Technical Specification will be spearheaded by Debra Haltrecht, Chief Technology Strategy.

NRCan is committed to moving these processes through in an efficient timeline and as such has committed two full-time positions to the team, as well as bringing in the capacity of the OEE Housing Division's New Housing, Existing Housing and Technical teams, as well as Canmet ENERGY technical support, and the ongoing consultation and input from stakeholders will be invaluable.

R-2000 Standard Review

NRCan, in conjunction with the Canadian Home Builders' Association (CHBA), has started a consultation process to renew the R-2000 Standard. R-2000 has been the best-in-class energy efficient label and the most comprehensive environmental standard in Canada for more than 25 years. However, the normal construction practices and code regulations in many provinces are catching up to the current R-2000 energy performance requirements. Thus it is important to redefine the overall performance requirements in order to once again position R-2000 houses at the leading edge of new home construction.

As a first step in the consultation process, NRCan will be forming a committee structured to take advantage of the strengths and expertise of its members and balanced by geographical representation. Using CHBA's proposed changes to the R-2000 Standard as a starting point, this committee will be involved in an active development process to renew the R-2000 Standard.

Updates on the progress of the renewal process will be available on the NRCan website at

R-2000
For information on the R-2000 Program, contact your local program office, or call
1-800-387-2000
www.R-2000.ca

www.newhomes.gc.ca. When the standard is available for public review and comment, this site will link you to the access location.

If you are interested in participating in or being kept informed of the committee process, please contact Debra Haltrecht.

ENERGY STAR for New Homes Common Specification for Ontario

NRCan is undertaking the development of a common technical specification that will apply to all ENERGY STAR qualified new homes built in Ontario from 2009 until at least March, 2011, and likely until the implementation of the ERS 80 levels in the building code.

The ENERGY STAR for New Homes (ESNH) initiative was launched in 2005 to provide a simplified means for builders to build energy efficient homes and to provide new homebuyers with a familiar symbol that represents a premium level of energy efficiency. The ESNH initiative aims to promote homes that are 25% more energy efficient than homes built to local building code requirements.

To date, NRCan has set the minimum requirements for ENERGY STAR qualified new homes.NRCan licensed service organizations that deliver the initiative have developed NRCan approved technical specifications that builders use to meet these requirements. With the success of the initiative and an ongoing expansion of the number of licensed service organizations, key stakeholders of the initiative have agreed that there is a need for a common technical specification that will create stability and consistency in the marketplace. The common specification will be based on the existing performance requirements as set by NRCan and be available for use by all builders, energy advisors, and service organizations. This common specification will not be an increase in performance levels, but a standardization of the marketplace.

The seven licensed service organizations operating in Ontario have agreed to work closely with NRCan to develop a draft common specification and bring it to public consultation for review and comment. During this period a special meeting with builders and energy advisors will be held to solicit their input.

Updates on the progress of the development process will be available on the NRCan website at www.newhomes.gc.ca. When the specification is available for public review and comment, this site will link you to the access location. ☼

Building with Glass

When we think of glass, our image is of transparent sheets of material that allow light and views through them. Thus it comes as a surprise to see concrete blocks that are actually made from glass.

The catch? It's really recycled glass that is manufactured to create a lightweight aggregate used in block manufacture.

Although everyone may be making efforts to be environmentally conscious and putting bottles in their blue box, many still end up in landfills. Most people are unaware that certain types of coloured glass can't be used to manufacture new products.

Atlas Block, an Ontario based manufacturer of concrete masonry units has acquired North American rights to Poraver®, an environmentally friendly, lightweight aggregate or filler made from coloured recycled glass from the municipal blue box programs. It is a product developed in Europe. Atlas Blocks' facility is capable of processing up to 80,000 tonnes per year of mixed coloured glass.

The process crushes recycled glass and turns it into a range of consistently sized lightweight spheres that are strong and versatile. They can be used for many industrial applications that include masonry adhesives, pre-cast concrete, ceiling tiles and even wastewater systems.

In addition to doing the right thing for the environment, products enhanced with Poraver® are cost efficient, offer excellent performance, consistent quality and meet or exceed all industry standards. They are non-toxic, non-combustible, chemically stable, unaffected by moisture, and free of any airborne silica. Plus, they provide excellent noise and heat insulation and have a high fire-resistance rating. ☼

Canadian Home Builders' Association

Technical Research Committee News

Product Safety Recalls

Smoke Alarms: Kidde Model Pi2000 Dual Sensor Smoke Alarms

A recall of 94,000 dual sensor smoke alarms has been announced because there is an indication that an electrostatic discharge can damage the unit, causing it to not warn consumers of a fire. The smoke alarms were marked with the UL Listing Marks for the United States and Canada.

The alarms, manufactured in China, can be identified by two buttons "HUSH" and "PUSH AND HOLD TO TEST WEEKLY" which are located on the front/center of the alarm. The model number and date code are on the back of the smoke alarm. Only date codes 2008 Aug 01 through 2009 May 04 are included in this recall.

The manufacturer, Walter Kidde Portable Equipment Inc., of Mebane, N.C. will provide a free replacement smoke alarm. For additional information, toll-free 877-524-2086 or *www.kidde.com*

Carbon Monoxide and Carbon Monoxide/ Smoke Combo Alarms

A recall of about 280,000 carbon monoxide detectors manufactured by Maple Chase Company of Plain City, Ohio has been announced. The recalled alarms can sound a "double chirp"/fault alarm in the presence of CO, prior to going into full alarm. Upon hearing a double chirp, the Owner's Manual instructions recommend a consumer take the alarm out of service, which could expose consumers to hazardous levels of CO and cause them to suffer injury or death.

The recall includes FireX branded 10000 Series CO Alarms and 12000 Series CO/Smoke combo alarms (manufactured in Mexico) with item numbers: 10000, 12000, 12000C, 12000-6, 12200, 12220, 12400, 12400C manufactured between June 1, 2007 and February 1, 2008. The date code appears on the back of the unit with a four-digit year, three-digit month followed by the day (ex: 2007JUN1 for June 1, 2007). Units with a manufacture date code prior to June 1, 2007 are not included in this recall.

Maple Chase Co. should be contacted immediately for a free replacement alarm and for arrangements to return the recalled alarms. The alarms should not be taken out of service until a replacement alarm is received.

For more information, Maple Chase Co. toll-free 1-888-879-3906 or *www.firexsafety.com*

Ontario Building Code Changes

Following on moves in BC, Ontario has introduced two new objectives for the Building Code – energy conservation and water conservation.

Ontario Accessible Standards

Ontario's Ministry of Community and Social Services released a proposed Accessible Built Environment Standard for public review. The proposed accessibility standard was developed by a committee of people from the disability and business communities, and proposes requirements for various categories of buildings and other structures in Ontario, including:

- Common access: entrances, doorways, ramps, stairs
- Exteriors: curbs, crossings, street furniture
- Plumbing: washrooms, showers, drinking fountains
- Communication: signage, telephones
- Air quality, acoustics, and lighting of buildings

For more information, or to review and comment on the proposed standard:

www.mcss.gov.on.ca/mcss/english/

Comments are being accepted until October 16, 2009.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector.

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Tel: (613) 230-3060
Fax: (613) 232-8214
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www.chba.ca

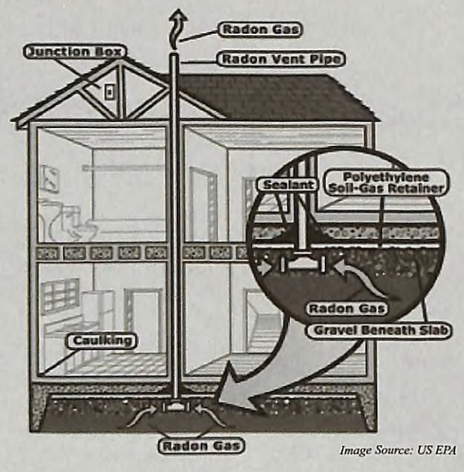


Image Source: US EPA

Radon-Resistant Construction

Health Canada has revised the guideline for safe limit for average annual radon exposure in homes to 200Bq/m³ (from 800 Bq/m³). This brings Canadian standards in line with that of other countries.

Builders and renovators need to understand the implications of this change, but they must also remember that radon levels can only be determined by testing over a period of time during the winter. For new construction, it is not possible to be certain of radon concentrations, even when the house is completed, without testing.

Many places have radon (no one knows for sure how many places) and most homeowners do not know they are living in a radioactive environment and/or do not know what to do if they find out they are in a contaminated area.

When building a new home in a region where radon is known to be a concern, details that permit future remediation, should it be needed, can be done easily. Building code changes are still being developed, but they will be prescriptive and will place the onus on the homeowner to test their home after occupancy.

When testing for radon, it is important to remember that there is no such a thing as a 'quick & simple' radon test. It can only be done after the building is completed, for a minimum one-month period (2-3 or more months is preferable), and the testing has to be done during the heating season to get meaningful results.

Health Canada and CMHC have documents describing radon-testing procedures. The best document is Guide for Radon Measurements in Residential Dwellings (Homes). *www.hc-sc.gc.ca*

Short-term test results (run for only a couple of days) are misleading and are not reliable. Some homes can test fine on one occasion but be over the limit for radon exposure on another day.

Basic Techniques for Radon-Resistant New Construction

In new construction, the main line of defence at the outset is to ensure that the basement has a good air seal – sealing all joints in the foundation walls and floors – and to provide granular material under the air barrier.

The US has been dealing with radon in houses for many years. The US Environmental Protection Agency, has a lot of information for radon remediation on their website:

www.epa.gov/radon.

Although there are a number of approaches to radon remediation, they require the air sealing of the foundation, and depressurization of the ground under the foundation, reducing the pressure difference between the foundation and the interior of the house, thus reducing the entry of soil gasses into the house.

Although the techniques may vary for different house foundations and building site conditions, the basic features that builders should include to prevent radon from entering a home are:

1. **Porous crushed rock.** Use a 4-inch layer of clean, coarse crush below the basement slab. This layer of gravel allows soil gasses, including radon, that occur naturally in the soil to move freely underneath the house. In some regions this crush rock layer is called 'radon' rock fill.

2. **Minimum 6-mil polyethylene plastic sheeting.** This not only prevents soil gasses from entering the house, but is also a moisture barrier under the basement floor slab, which controls moisture migration through the concrete into the house.

3. **Sealing and Caulking.** Seal all openings, cracks, and crevices in the concrete foundation floor (including the slab perimeter crack) and walls with polyurethane caulk to prevent radon and other soil gasses from entering the home.

4. **Vent Pipe.** Install a 3-inch or 4-inch solid PVC Schedule 40 pipe, vertically from the gravel layer (stubbed up when the slab is poured) through the house and roof to safely vent radon and other soil gasses outside above the house. The proposed building code requirement will only be to install a pipe stub in the basement floor, capped and labelled clearly as a radon vent (so that it is not used for other purposes). However, installing the pipe for the full run, or at least up to the attic, will make it easier to hook up a vent and fan later if it is required.

   A solid pipe running through the house could provide passive ventilation in some cases. This avoids the need for a continuously running fan to provide sub-slab depressurization. It helps to reduce radon in the house, and serves as the radon exit point if the system has to be changed to active sub-slab depressurization. However, this may not work in all cases.

   The vent pipe has to be aligned so that it can go through the walls or a chase, and it should be insulated in the attic. There will have to be a flashing at the top where it penetrates the roof, and perhaps a bird screen.

   If the passive venting, which requires a stack effect to draw air, is not adequate to deal with radon, a small in-line fan can be installed to provide the required continuous airflow. Even in houses where radon may not be a problem, such a vent can help keep the slab dry and minimize the entry of soil gases into the house.

5. **Junction Box.** Install an electrical outlet in the attic for use with a vent fan, in the event that radon testing shows that a more robust system is needed.

All of the techniques and materials described are commonly used in construction, so no special skills or materials are required when adding radon-resistant features as a new home is being built. ☼

Insulating Sheathing

Fibreboard panels produced from non-toxic organic materials and natural wood fibres are widely used for sheathing, especially in Eastern Canada. The panels are asphalt coated on both sides to provide weather resistance, yet they have high water vapour permeability that allows water vapour to move across the sheathing and not be trapped within the wall cavity where it could cause damage.

Fibreboard is used on the exterior of frame construction where its excellent permeability, racking strength and weather resistance provide a panel that is an excellent base for exterior wall finishes, although it provides limited structural racking strength.

Manufacturers claim an insulation value of approximately R-2 for a typical ½" thick sheathing panel – which is not much more than that for wood framing itself which has an R-value of about 1.25/inch.

Rigid insulation installed across the face of the exterior wall framing is the most effective way to improve the energy efficiency of a house by reducing the thermal bridging of the wood. The rigid insulation provides a thermal break, thus improving the effective R-value of the assembly.

Building Products have introduced R-4 Insulsheathing – a new structural insulating panel that is a version of their Excel fibreboard. It is a laminated low-density fibreboard, asphalt coated (facing outward) with a layer of expanded polystyrene insulation on the interior, to provide a panel with an insulation value of R-4. Panels are 4'x9', and have a total thickness of 1-¼". It is currently distributed in Quebec and New Brunswick.

Building Products of Canada
www.emcobp.com

Austrian High Performance Windows

We use windows for light and views. We also want to be able to open them, so that at appropriate times we can open the interior to the outside environment for fresh air, to capture breezes on a warm day, and to catch the fresh garden aromas.

At the same time, in a cold climate, windows are a thermal hole in the building. They are the least insulated element in a building, and so are the major source of heat loss. Properly positioned, they also represent solar gains to warm our homes.

The challenge is to find the right balance between light and views, minimizing heat loss and optimizing solar heat gain.

Every window manufacturer will tout their product as the best, but until recently almost all attention has focused on the design of the window frame and hardware from the aesthetic point of view, and not on the performance. Changes in window glass technology, window hardware, frame design, sealants and spacers have improved the options available for designers and builders.

Long gone are the days when glass was glass, and the glazier installed a pane of clear glass in a site-built wood frame with some putty or perhaps some wood trim. No matter how carefully they were installed they were neither airtight nor high performance. We now have factory manufactured products with an overall performance matching that of a traditional 2x4 insulated wall.

As much as we may think we've got great products in this country, our lower priority on high performance buildings has meant that manufacturers have been challenged to make a viable business case for their very high performance units because of limited demand. This has also meant incremental prices for higher performance have remained high.

The same cannot be said of other countries. Europe, with its commitment to net zero energy buildings, has been pushing the development of high performance windows. Now, some European manufacturers are branching out into North America.

Europe's largest window manufacturer,– Austria's Internorm, was promoting their wares at the recent Canada Green Building Council conference in Montreal.

They have a full product line of vinyl, wood and wood-clad windows. The eye-catching products are their quad-glazed units. These have sealed triple glazed low-e windows with blinds. The blinds are placed between the fourth layer of glass and the triple glazing. Depending on the glass, the U-value can be as low as 0.63 W/m²K, with a sound insulation of up to 44 dB.

Careful attention to gasket design and materials provides a very airtight unit that should resist the most extreme stormy weather conditions.

Information:
Holz & Form Canada
604-682-6966
www.greenbuilding-windows.com

Points to consider when buying windows

Orientation: north-facing windows lose heat, south-facing windows capture solar gains that can be used for space heating. An appropriate balance is needed. Depending on the house design, different window characteristics should be considered for different orientations.

Thermal performance: since windows represent the largest single source of heat loss in the average house, higher performance windows reduce the home's heat loss.

Air Sealing: good windows will have tight-fitting air seals to reduce heat loss, and prevent rain penetration in driving rain. The air-tightness of the window units themselves must be matched with proper window installation in an airtight assembly.

Condensation Resistance: higher performance windows have a warmer interior surface temperature so will tolerate higher indoor humidity before condensation occurs.

Noise: multi-pane glazing and airtight windows can be a significant factor in reducing noise transmission into the house.

Forced Entry: window replacement should be simple yet burglar resistant.

What Were They Thinking About?

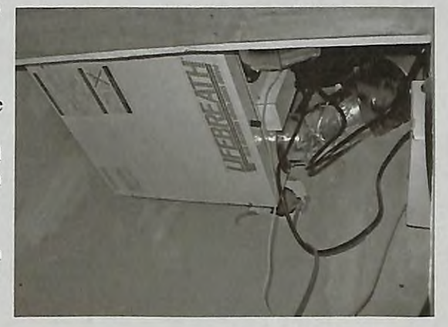
Getting out to job sites gives us a great opportunity to review the state of construction today. Although new construction in Canada generally meets a high standard, regrettably there are far too many instances where we have to wonder. Here are a couple of examples where we simply must ask the question, "what were they thinking of?" The images are not flattering.

While these tend to be trade specific details, there is a systemic aspect to these, because the trades too often point out that the design simply does not allow for their work - especially mechanical systems. We know that homes will have heating and ventilation systems, yet designers and owners too often treat them as an afterthought, and resist any attempt to properly accommodate them. Regrettably, the trades go along with the limitations imposed, even when they know it will compromise the system performance.

If you ever have wondered what happens without adult supervision, here are a few examples we've come across.

This is an example where the required ductwork was squeezed into the available space, seemingly with little regard whether there would be any impact on the airflows or system performance.

Heat recovery ventilators are now commonly used across the country. The City of Vancouver has now legislated their use. But unfortunately the City doesn't seem to understand the importance of their proper installation, as they are not doing any inspections on these systems, and have not replied to the overtures made by local industry to help put some protocols in place.



This image has not been rotated – we are looking up at a unit that has been tucked against the ceiling in a small utility space. The problem here is that like most HRVs, the front panel of the unit is meant to open up to provide maintenance access to the filters, core and motors, and the bottom (on the right) is a pan with a drain to catch condensation.

As installed, drainage cannot take place, and when the door is opened, the debris and bugs that have been collected in the unit will fall onto whoever is standing under the unit. When someone does the maintenance once, will they be eager to maintain it regularly? And what happens to the condensation captured by the unit in winter?

Five plates must be better that one or two! Why bother framing a wall over the window (especially one that is not carrying any load) when you can just pile up the plates, especially when the rough opening was framed a bit too large? After all, wood is cheap these days, and we need to support the lumber industry.

Need we say more?

Energy Answers

Rob Dumont

Have government energy savings programs made much of a difference?

Here in North America we have a very good example of how enlightened government energy programs have radically reduced the growth in electricity demand. California has done it.

In figure 1, a graph of California's electricity sales per capita from 1960 to 2005 is presented.

As can be seen from the graph from the California Energy Commission, electricity sales per capita levelled off in the early 1970s and have been approximately constant for 35 years.

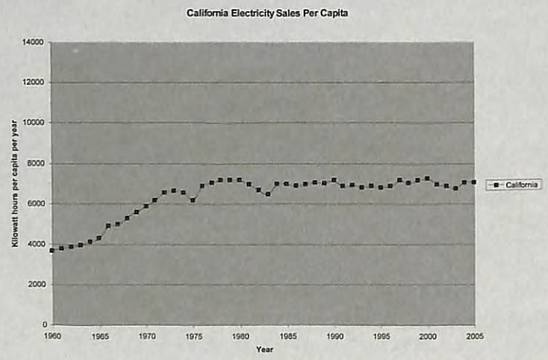


Figure 1. Electricity Sales per Capita in California (1960-2005)

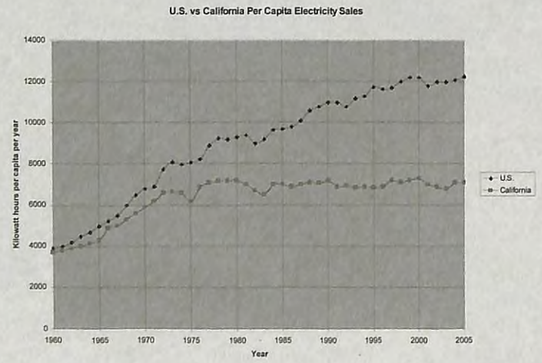


Figure 2 presents a comparison of California with the U.S.

Note how the U.S. figures have continued to climb over the 45-year period while California has maintained a relatively constant value since the early 1970s.

In California, which now has over 30 years of activist energy management programs, the annual electrical energy sales per capita is about 7,100 kilowatt hours.

For the United States as a whole, the comparable figure is 12,250 kWh per capita, or 73% higher than California.

For Canada, the comparable figure is about 16,500 kWh per capita, or 132% higher than California's number!

While it is true that California has a milder climate than Canada and less need for space heating, California has a hotter climate, and more need for air conditioning.

California now has the following policy in place: "The state, in meeting its energy needs, would invest first in energy efficiency and demand-side resources, followed by renewable resources, and only then in clean conventional electricity supply." (California Energy Commission)

The California Energy Commission has been a world leader in encouraging stronger building energy codes, and in regulating appliance, lighting and electric motor efficiency values. The California Public Utilities Commission has pioneered allowing electrical utilities to make money by implementing energy conservation programs. By comparison, most provinces in Canada still do not have any building energy code at all, and our appliance energy standards are basically "me-too" copies of the weak U.S. national standards.

The Canadian Government at the recent G8 summit in Italy was rated 7th out of the 8 countries for its weak policies regarding energy efficiency. We managed to beat only Russia.

Some years ago I read a quote about energy consumption that went something like this: "If electrical energy consumption continued to increase at 7% per year (as it had for the first 70 years of the 20th century) the following would happen: After four more centuries of growth at this rate, the earth would be a solid sphere of power plants whose outer boundary would be expanding at the speed of light." World growth in electricity consumption at high rates is suicidal for the planet.

Another inconvenient truth about energy consumption is that even modest growth rates over long periods of time result in big problems. My favourite example is to take one penny and invest it at 2% compound interest. After about 1,900 years, that 1 penny is worth more than the entire stock of money in the world. (That one penny grows to 220 trillion dollars).

California has shown that far-sighted government action can make a tremendous difference.

It is well to remember that there are also short term health spinoffs from the kind of conservation actions taken by California. As quoted in the Globe and Mail of July 13, 2009 "Each year, according to the Ontario Medical Association, the province's coal plants kill 668 people while causing 1,100 emergency room visits and more than 300,000 minor illnesses."

Here in Canada a number of electric utilities and provinces have recently embarked on major initiatives in the electrical energy and conservation areas. California has a major head start.☼

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Attached Garage Insulation – Alberta Code Requirements

Amendments to the Alberta Building Code 2006 include a requirement to provide a drywall finish (or other similar material), along with insulation and vapour barrier to the interior of attached garages.

The requirement for the interior finish was added to delay the spread of a fire originating in an attached garage and to give occupants extra time to evacuate the dwelling unit. The requirement for insulation and a vapour barrier was added as a precautionary measure because of the interior finish requirement. It was felt that homeowners who purchase a house with a finished garage may be unaware that there was no insulation in the walls. If that homeowner were to then provide heat to the garage, thinking that it was in fact insulated, condensation would form within the exterior wall assembly, which could lead to deterioration of the garage structural supports and the potential for the formation of mould and mildew.

STANDATA No. 06-BCI-023, issued July 2009, was developed to clarify what the minimum insulation values are to be in unheated attached garages. Walls must be R-12 and ceilings R-34 (these are nominal R-values).

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Building Science Insight 2009-2010: Energy Efficiency in Buildings

This year's Building Science Insight seminars, presented by the NRC Institute for Research in Construction, will address the efficient use of energy in buildings. The program will consist of five presentations on recent research and one on issues related to energy codes. The seminar will focus on new tools and technologies pertaining to energy efficiency in buildings and will cover the following topics:

Overview of the National and Provincial Energy Codes for Buildings

This presentation will provide an overview of the development of the Model National Energy Code for Buildings 1997 and its evolution to the updated provisions planned for the National Energy Code for Buildings 2011. It will also discuss the current and future status of energy regulations for buildings in the provinces and territories and their association with the National Energy Code for Buildings 2011.

Dimmable Lighting: Energy Savings and Occupant Satisfaction

Dimming ballasts with appropriate controls can reduce lighting energy consumption as much as 50%. Personal dimming controls can produce additional energy savings of about 10% while also improving occupant satisfaction and productivity. NRC-IRC researchers will review their recent findings in this field and predict future trends.

Energy Ratings of Window and Wall Assemblies

This presentation will summarize the procedure for window Energy Rating found in CSA Standard A-440.2 and its relationship to Natural Resources Canada's ENERGY STAR program. It will also provide examples of the results of NRC-IRC research on high-performance glazing systems and present a procedure for comparing the thermal performance of walls built with different insulation materials.

Making Buildings Responsive to Peak Energy Demand

Meeting peak electrical demand is costly, but failure to do so leads to blackouts. Building operators can help ensure reliable and cost-effective electrical service by dimming lights and changing thermostat set points and ventilation rates during peak periods. This presentation looks at the extent to which energy demand can be reduced without significantly affecting the indoor environment.

High-Performance Thermal Insulation in Building Envelopes

Although still virtually unknown in Canada, vacuum insulation panels (VIP's) have thermal resistance values up to 10 times those of conventional insulation materials. This presentation will outline NRC-IRC studies on the performance and construction of VIPs, explain how they work, and demonstrate the challenges and advantages of using them in building construction.

Energy-Efficient Roofs

Properly designed roofs can play a significant role in efforts to achieve energy efficiency and sustainability in construction. This presentation will review and clarify misunderstandings surrounding sustainable, green, reflective and high-performance roofs; present some recent research on the performance of these roofs; address environmental, durability and life-cycle issues; discuss design and construction; and encourage the use of new technologies.

The speakers for the 2009-2010 Building Science Insight seminars include NRC-IRC researchers Hakim Elmahdy, Guy Newsham, Phalguni Mukhopadhyaya, Benjamin Birt, Aziz Laouadi, Mike Swinton, Ralph Paroli and Morad Atif, as well as technical advisors from the Canadian Codes Centre, Cathleen Taraschuk, Mihailo Mihailovic and Heather Knudsen. Provincial representatives responsible for energy regulations will also be invited to address energy code issues.

The one-day seminars will be held in the following locations:

English Seminars

- Vancouver Oct. 6, 2009
- Whitehorse, Oct. 8, 2009
- Winnipeg, Oct. 20, 2009
- Edmonton, Oct. 22, 2009
- Iqaluit, Nov. 3, 2009
- Regina, Nov. 16, 2009
- Calgary, Nov. 18, 2009
- Yellowknife, Nov. 20, 2009
- St. John's, Dec. 1, 2009
- Halifax, Dec. 3, 2009
- Toronto, Dec. 9, 2009
- Fredericton, Jan. 12, 2010 *
- Ottawa, Jan. 15, 2010*

French Seminars

- Quebec, Feb. 9, 2010
- Montreal, Feb. 11, 2010*

* *With simultaneous translation*

To register for the seminar and to obtain more information, please visit the Web site at http://bsi.gc.ca. The registration fee for the seminar is $349 plus tax and $75 for students. Discounts are available for 10 or more registrants from the same organization.

National Research Council Canada | Conseil national de recherches Canada

Energy Retrofits for Houses Conference

The first Energy Retrofits for Houses conference will take place October 28 – 29, 2009 in Toronto. The conference is the first of its kind in Canada and is modeled after the popular Affordable Comfort conferences in the US.

The conference will be of interest and benefit to insulators, renovators, building inspectors, auditors, building scientists, municipal and provincial officials, and utilities – in other words, to all industry professionals who are interested in saving energy in houses without jeopardizing the health and safety of the homeowners. In addition to the conference, there will be a one-day exposition of technologies, products and services on Wednesday, October 28.

Canadian experts in energy efficiency and healthy buildings will be delivering a range of workshops and case studies to demonstrate best practices and lessons learned in the industry. The program will also feature some US weatherization experts who will discuss the evolution of their programs and practices over the last 25 years.

The Energy Retrofits for Houses conference will provide an exciting opportunity for sharing information on how to save energy in homes.

For information on the sessions, the venue, and registration:
http://www.energyretrofitsforhouses.com

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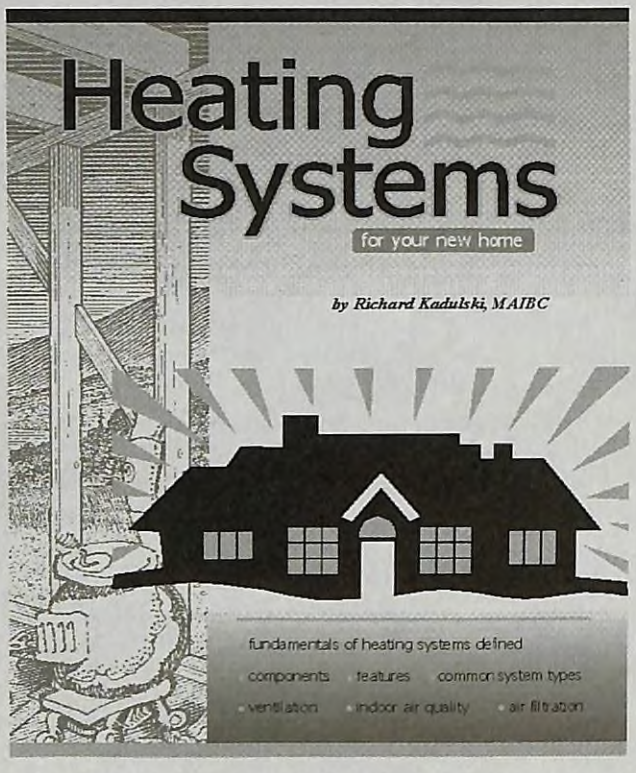

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